

## Cytological Observations on *Asplenium paucivenosum*

S. S. BIR\*

*Asplenium paucivenosum* (Ching) Bir (Bull. Bot. Surv. India 4: 3. 1962a) was described as *Ceterach paucivenosa* by Ching in 1931 from Yunnan, a province of China adjacent to Burma. It closely resembles *A. dalhousiae* Hooker [*Ceterach dalhousiae* (Hooker) C Chr.], with which the eastern Himalayan specimens have often been considered conspecific.

In the Indian region *A. paucivenosum* is confined to the eastern part (Darjeeling–Sikkim east to Assam), whereas *A. dalhousiae* is found in the western part of the Himalayas (Nepal west to Kashmir). Both of these spleenworts were placed in the genus *Ceterachopsis* by Ching (1940), which has been recognized as a subgenus of *Asplenium* by Bir (1962a; Mehra & Bir, 1964). The species of *Asplenium* subg. *Ceterachopsis* superficially resemble *Ceterach officinarum* Lam. & DC. in frond size and pinnatifid frond outline, but differ in having indusia covering the sori and in the absence of scales on the under surface of the laminae. They occur in Yunnan and the Himalayas south to Burma, and also in Ethiopia, Arizona, and northwestern Mexico.

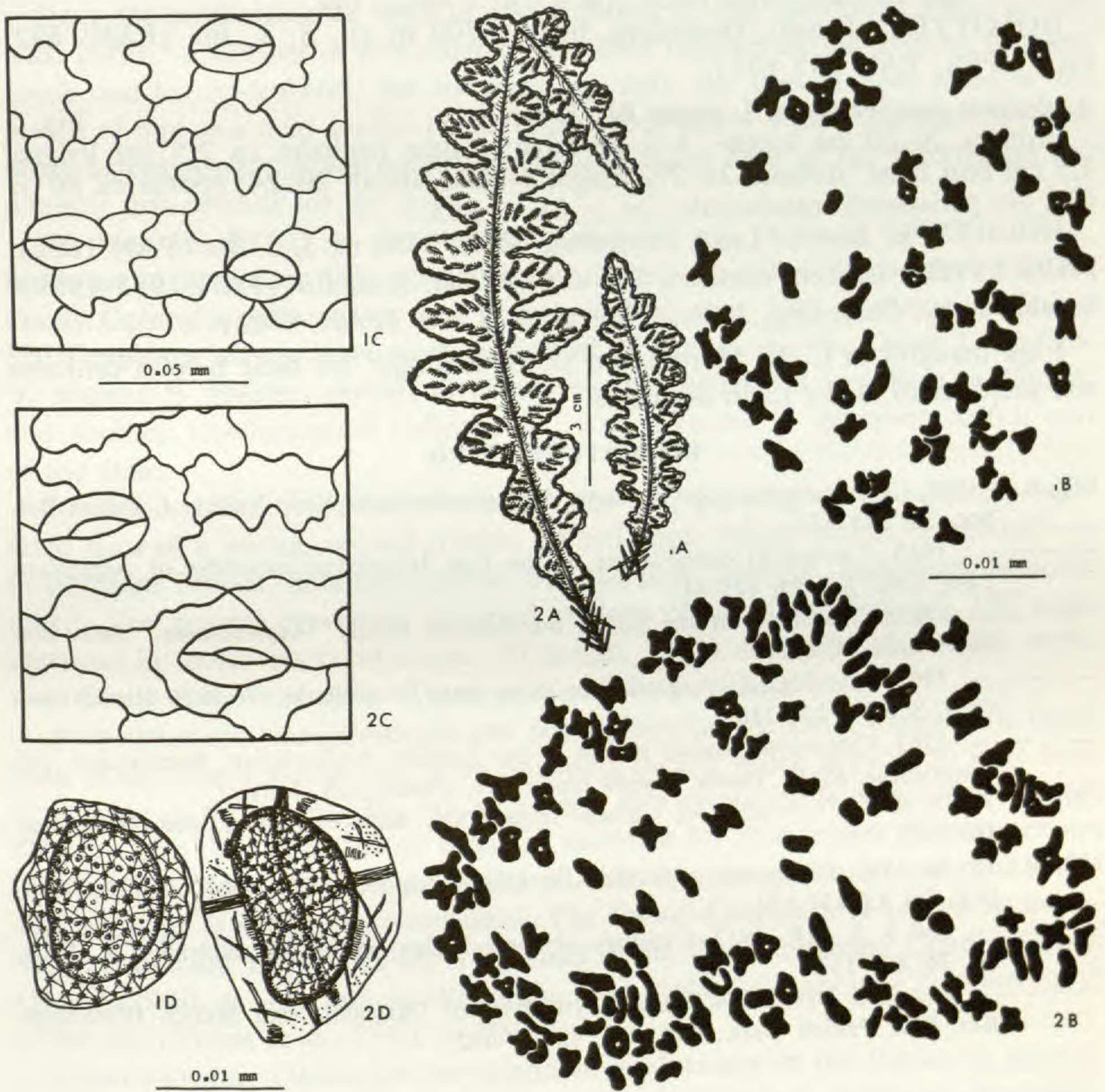
*Asplenium paucivenosum* is very rare in the eastern Himalayas. It prefers well-shaded rock crevices deep in the forests in the Darjeeling district of West Bengal and Sikkim, between 2,400 and 2,700 m altitude. The chief features distinguishing *A. paucivenosum* from *A. dalhousiae* are the conspicuously hyaline and chartaceous margin of the pinna lobes, the discrete sori at maturity with well-developed, persistent indusia (which are almost the same size in both species), and the large spores ( $70\text{--}86\mu \times 54\text{--}62\mu$ ) with a very broad perispore forming a reticulate pattern of the surface folds. The fronds are 4–30 cm long and 1.5–5 cm wide, with small but distinct, scaly stipes and midribs that are scaly beneath and often wavy; the sinuses between the lobes of the laminae are rounded.

*Asplenium dalhousiae*, which grows in the crevices of rocks or masonry or often in the shade at the base of shrubs between 900 and 2,100 m altitude, has often confluent sori, with the indusium curling back or even deciduous at maturity, and small spores ( $28\text{--}45\mu \times 24\text{--}30\mu$ ) with a relatively narrow, folded perispore. Throughout the western Himalayas (Kulu, Simla, Nainital, and Mussoorie) *A. dalhousiae* is a diploid, with  $n = 36$  (Bir, 1959, 1962b, 1965; Mehra & Bir, 1957).

Both tetraploid and octoploid sexual plants of *A. paucivenosum* have been found in Darjeeling and Sikkim in the eastern Himalayas (Bir, 1960; Bir in Mehra, 1961). These are easily distinguishable in the field on the basis of frond size (Figs. 1A, 2A). Tetraploid plants ( $n = 72$  during meiosis; Fig. 1B), collected only at Tonglu, have small fronds. The octoploid plants ( $n = 144$  during meiosis; Fig. 2B) grow abundantly in Senchal forest near Darjeeling and near Lachen in Sikkim. These are robust, with larger fronds, stomata, epidermal cells, and spores (Fig. 2C, D).

\*Department of Botany, Punjabi University, Patiala, India.





Figs. 1-2. *Asplenium paucivenosum*. Fig. 1A-D. Frond, spore mother cell, lower epidermis, and spore of *A. paucivenosum* f. *minus* (4x = 144). Fig. 2A-D. Frond, spore mother cell, lower epidermis, and spore of *A. paucivenosum* f. *majus* (8x = 288).



The cytomorphological distinctness of the two forms of *A. paucivenosum* clearly justifies their taxonomic recognition:

***Asplenium paucivenosum* f. *minus* Bir, f. nov.** Fig. 1

Frondes 4–10 cm longae, 1.5–2.5 cm latae; pinnae mediales usque ad 1.5 cm longae, 0.8 cm basi latae; stomata 24–27 $\mu$  longa; cellulae annuli 18–22; sporae ca 70  $\times$  54 $\mu$ , ala perisporiali fusca opaca;  $2n = 4x = 144$ .

HOLOTYPE: Tonglu, Darjeeling, India, 2700 m alt, S. S. Bir (PAN<sup>1</sup> 692; ISOTYPES: PAN 693–695).

***Asplenium paucivenosum* f. *majus* Bir, f. nov.** Fig. 2

Frondes 20–30 cm longae, 3–5 cm latae; pinnae mediales ca 2.5 cm longae, 1.5 cm basi latae; stomata 36–39 $\mu$  longa; cellulae annuli 20–24; sporae ca 86  $\times$  62 $\mu$ , ala perisporiali translucente;  $2n = 8x = 288$ .

HOLOTYPE: Senchal Lake, Darjeeling, India, 2400 m, S. S. Bir (PAN 1602).  
PARATYPES: Lachen, northern Sikkim, 2400 m, S. S. Bir (PAN 1955–1959).  
Senchal Lake, Darjeeling, India, 2400 m, S. S. Bir (PAN 4762).

I am thankful to C. V. Morton and D. B. Lellinger for their helpful criticism and preparation of the Latin diagnoses.

#### LITERATURE CITED

- BIR, S. S. 1959. Cytotaxonomic notes on some Aspleniaceae from Kulu Valley. *J. Indian Bot. Soc.* **38**: 528–547
- . 1960. Cytological observations on the East Himalayan members of *Asplenium* Linn. *Curr. Sci.* **29**: 445–447.
- . 1962a. Taxonomy of the Indian members of family "Aspleniaceae." *Bull. Bot. Surv. India.* **4**: 1–16
- . 1962b. Cytological observation on some ferns from Simla (Western Himalayas). *Curr. Sci.* **31**: 248–250.
- . 1965. Cytomorphological studies in the families Aspleniaceae, Blechnaceae and Vittariaceae. Ph.D. Thesis, Panjab University, Chandigarh, India.
- CHING, R. C. 1940. The studies of Chinese ferns—XXX. *Bull. Fan Mem. Inst. Biol., Bot.* **10**: 1–22.
- MEHRA, P. N. 1961. Chromosome numbers in Himalayan ferns. *Res. Bull. Panjab Univ., N.S., Sci.* **12**: 139–164.
- , and S. S. BIR. 1957. Cytology of some Indian species of *Asplenium* L. *Curr. Sci.* **26**: 151–152.
- , and S. S. BIR. 1964. Pteridophytic flora of Darjeeling and Sikkim Himalayas. *Res. Bull. Panjab Univ., N.S., Sci.* **15**: 69–182.

<sup>1</sup> Abbreviation of the Panjab University Herbarium, Chandigarh, India.